Freshwater Harmful Algae Blooms and Public Health

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Focus

- Cyanobacteria & Toxins (Cyanotoxins)
- Cyanobacteria Toxins & Health Effects List
- 2019 – Summary of Human and Animal HAB-Reported Health Effects
- Challenges
- HAB Task Force Efforts to Prevent Human & Animal HAB Exposure

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Health Effects - Cyanotoxins

Most common HAB associated exposure is while swimming or participating in other recreational activities

Routes of Exposure-

- Ingestion – when accidentally swallowing contaminated water
- Dermal –by direct contact
- Respiratory and/or Aspiration
- Others – less common
  - Ingestion of cyanotoxin-contaminated drinking water
  - Consumption of cyanotoxins - contaminated food
  - Skin through cosmetic applications,
  - Medically – example renal dialysis – uses of contaminated water

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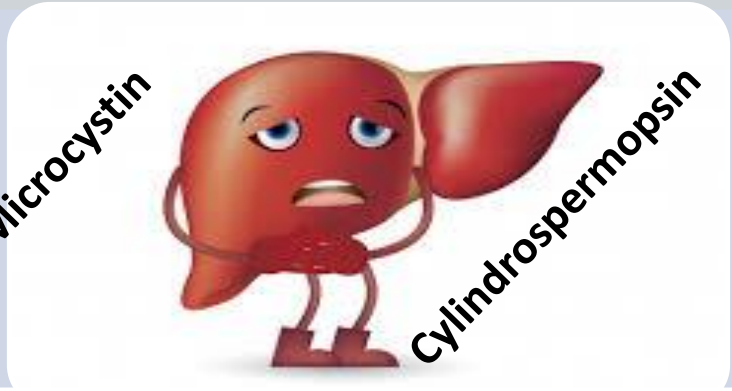
Health Effects

Four major cyano-toxins:



Known Hepatotoxin

Patients present with:

Hepatomegaly, gastroenteritis (diarrhea, nausea, vomiting, abdominal pain), fever, malaise, headache, and elevated liver enzymes

Symptoms onset: Minutes to hours

Could be similar to:

Acute viral hepatitis and other Toxic Hepatitis

known **Neurotoxins:**

Patients present with:

Tremor, twitching, muscles cramps, motor weakness, paresthesia, cardiac or respiratory paralysis

Symptoms onset : Minutes to hours

Could be similar to:

Pesticide poisoning and other toxin poisoning

Other toxins/chemical irritants:

Lippopolysaccharides (chemical irritants)

Dermatoxins (lyngbyatoxin) – produce only by lyngbya spp

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Health Impacts of Cyanotoxins

CLEAN WATER ACTION
CLEAN WATER FUND

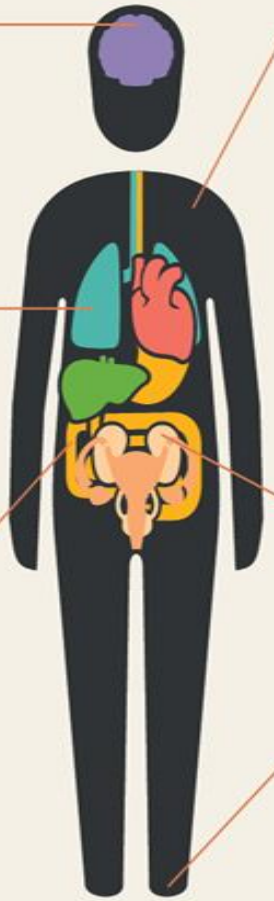
Note: *Not all cyanotoxins lead to all of these health impacts. These listed impacts are caused by microcystins or cylindrospermopsin, the two cyanotoxins that EPA has issued Health Advisories for.*

IN HUMANS

Brain
Source: Ingestion
Symptoms:
- Headache
- Incoherent speech
- Drowsiness
- Loss of coordination

Respiratory System
Source: Inhalation
Symptoms:
- Dry cough
- Pneumonia
- Sore throat
- Shortness of breath
- Loss of coordination

Digestive System
Source: Ingestion, drinking contaminated water, or eating contaminated fish
Symptoms:
- Abdominal pain
- Nausea
- Vomiting
- Diarrhea
- Stomach cramps



Body
Source: Contact, e.g. swimming
Symptoms:
- Irritation in eyes, nose, and throat
- Blistering around the mouth
- Skin rash, including tingling, burning and numbness
- Fever
- Muscle aches (from ingestion)
- Weakness (from ingestion)

Organs
Source: Ingestion
Symptoms:
- Kidney damage
- Abnormal kidney function
- Liver inflammation

Nervous System
Source: Ingestion
Symptoms:
- Tingling
- Burning
- Numbness

IN PETS

Symptoms:
Vomiting
Fatigue
Shortness of breath
Difficulty breathing
Coughing
Convulsions
Liver failure
Respiratory paralysis leading to death

Cyanobacteria Toxins & Health Effects List

http://www.vdh.virginia.gov/content/uploads/sites/12/2019/08/FINAL-Cyanobacteria-Toxins-Health-Effect_12919.pdf

Purpose

- Educate
- Protect public health
- Hybrid management approach - potentially toxigenic genera compared with advisory thresholds

Development of current version

- EPA/CDC genera lists
- Other states and HAB research papers

2019 HAB Symposium Poster Session – Gulf Shores, Alabama; copies of list handed out with poster for feedback. From Left – Leah, Todd, Amani, Margaret

Validation by the HAB Community

- Handout & poster -10th US HAB Symposium
- EPA & CDC requested feedback of the HAB community by March 31, 2020
- GOAL – Mid-Atlantic list of potentially toxigenic cyanobacteria which has been validated by the HAB community

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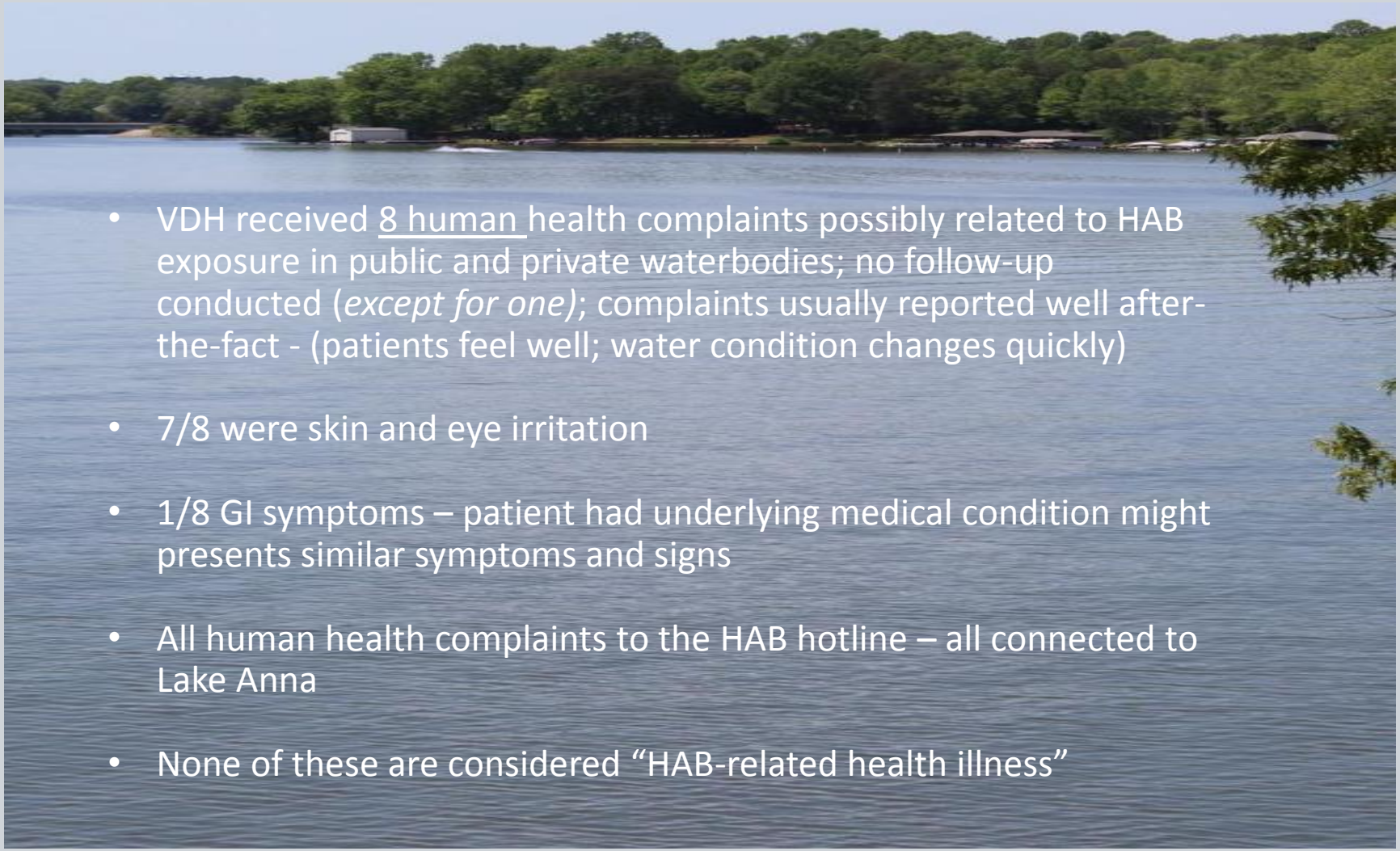
2019 Summary of Human and Animal HAB - Reported Health Effects



- VDH received 8 human health complaints possibly related to HAB exposure in public and private waterbodies; no follow-up conducted (*except for one)*; complaints usually reported well after-the-fact - (patients feel well; water condition changes quickly)
- 7/8 were skin and eye irritation
- 1/8 GI symptoms – patient had underlying medical condition might presents similar symptoms and signs
- All human health complaints to the HAB hotline – all connected to Lake Anna
- None of these are considered "HAB-related health illness"

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North Carolina – Three Dogs Died

NC - 3 dogs died due to swimming in a pond contained blue – green algae; <u>August 2019</u>

- Outrage over the dog deaths –for pets and HAB exposure
- Many calls to test private lakes/ponds
- 3 dog/1 cat deaths were reported in Virginia **<u>AFTER NC</u>**
- Un-confirmed linkage to HAB exposure -
- One report received two days after dog died - HAB TF worked with DSI, veterinary epi, and TJ health director - water sampled –HAB not found
- Other reports were few weeks after the pet's deaths (water status changed – bodies were not available)
- CDC/EPA resources made available for public, physician, and veterinarian references

- The first dog experienced the symptoms 15 m after leaving the pond, followed by the 2nd, and the 3rd dog. The 3 dogs died few hrs after exposure

A North Carolina woman took her three dogs to a pond to play. Within hours, her pups had died from toxic algae

Every state felt this impact! Everyone cared!!

- Pets like dogs are more susceptible to get infected because of:
  - Their small bodies
  - High risk to drink from impacted water
  - They lick their fur – ingestion of cyanotoxin

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Physician Reference

Cyanobacteria blooms. *When in doubt, it's best to stay out!*

What are cyanobacteria?

- Cyanobacteria, sometimes called blue-green algae, are microscopic organisms that live in all types of water.

What is a cyanobacteria blooms?

- Cyanobacteria grow quickly, or bloom, when the water is warm, slow-moving, and full of nutrients.

What are some characteristics of cyanobacteria blooms?

- Cyanobacteria usually bloom during the summer and fall. However, they can bloom anytime during the year.
- When a bloom occurs, scum might form on the water's surface.
- Blooms can be many different colors, from green or blue to red or brown.
- As the bloom dies off, you might smell an odor that is similar to rotting plants.

What is a toxic bloom?

- Sometimes, cyanobacteria produce toxins.
- The toxins can be present in the cyanobacteria cells or in the water.

Other important things to know:

- Swallowing water that has cyanobacteria or cyanobacterial toxins in it can cause serious illness.
- Dogs might have more severe symptoms than people, including collapse and sudden death after swallowing the contaminated water while swimming or after licking cyanobacteria from their fur.
- There are no known antidotes to these toxins. Medical care is supportive.

You cannot tell if a bloom is toxic by looking at it.

To report a cyanobacteria bloom or related health event:

- Call your local or state health department

For more information:

- https://www.cdc.gov/habs/general.html

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https://www.cdc.gov/habs/pdf/habsphysician_card.pdf

Veterinarian Reference

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https://www.cdc.gov/habs/pdf/habsveterinarian_card.pdf

Buttons/Badges CDC – OHHABS Reporting Forms

OHHABS
ONE HEALTH Harmful Algal Bloom System

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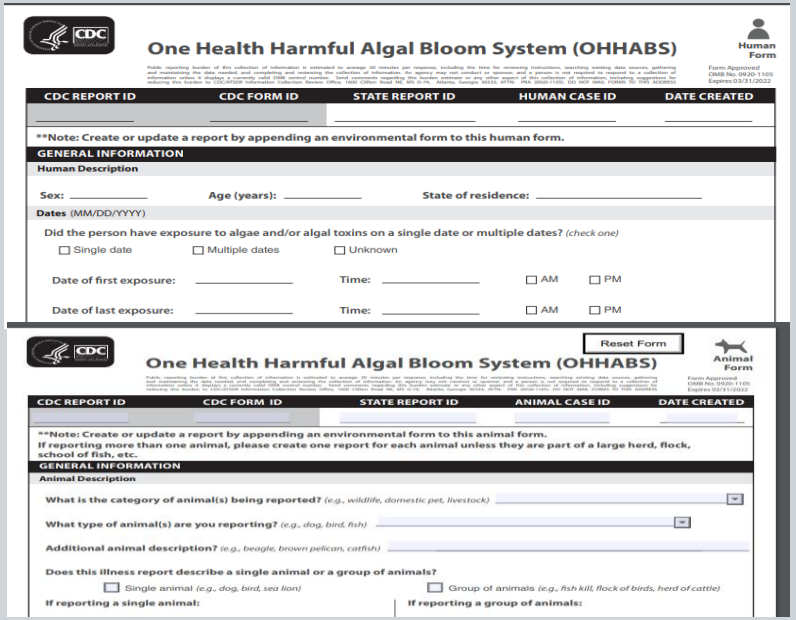
Challenges of Confirming Reported Health-Effects to HABs

- Reports typically are well after exposure
- Dog necropsy difficult to perform or no body is available
- Outreach to Physicians and Veterinarians on the questions to ask of patients or pet owners to ensure proper diagnostics can be performed
- Difficulty to biologically link health problem to HAB exposure both in human and animals- due to limitation of diagnostic tools
- Gap in CDC HAB Case Definition – difficulty to meet the requirements
- OHHABS form is long: 6 and 5 pages for human and animal respectively

https://www.cdc.gov/habs/ohhabs.html

OHHABS
ONE HEALTH Harmful Algal Bloom System


One Health Harmful Algal Bloom System (OHHABS)

Human Form

CDC REPORT ID | CDC FORM ID | STATE REPORT ID | HUMAN CASE ID | DATE CREATED

**Note: Create or update a report by appending an environmental form to this human form.

GENERAL INFORMATION

Human Description

Sex: _____ Age (years): _____ State of residence: _____

Dates (MM/DD/YYYY)

Did the person have exposure to algae and/or algal toxins on a single date or multiple dates? (check one)

☐ Single date ☐ Multiple dates ☐ Unknown

Date of first exposure: _____ Time: _____ ☐ AM ☐ PM

Date of last exposure: _____ Time: _____ ☐ AM ☐ PM

Reset Form

One Health Harmful Algal Bloom System (OHHABS)

Animal Form

CDC REPORT ID | CDC FORM ID | STATE REPORT ID | ANIMAL CASE ID | DATE CREATED

**Note: Create or update a report by appending an environmental form to this animal form.
If reporting more than one animal, please create one report for each animal unless they are part of a large herd, flock, school of fish, etc.

GENERAL INFORMATION

Animal Description

What is the category of animal(s) being reported? (e.g., wildlife, domestic pet, livestock)

What type of animal(s) are you reporting? (e.g., dog, bird, fish)

Additional animal description? (e.g., beagle, brown pelican, catfish)

Does this illness report describe a single animal or a group of animals?

☐ Single animal (e.g., dog, bird, sea lion) ☐ Group of animals (e.g., fish kill, flock of birds, herd of cattle)

If reporting a single animal: | If reporting a group of animals:

Research presented in 2019 - US HAB symposium - Greenwatre lab in Florida confirmed cyanotoxins in 6 dogs using ELISA and other techniques to test (vomitus, blood, urine, bile, liver, kidney, hair)- link below:
http://ushabs.com/lib/2019_HAB_abstracts.pdf

- **Step forward for future discussion**

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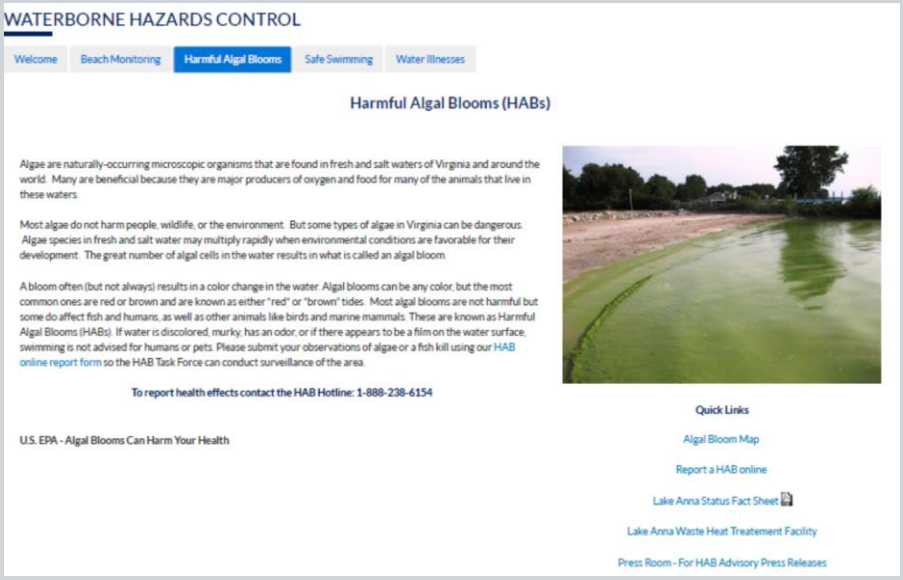
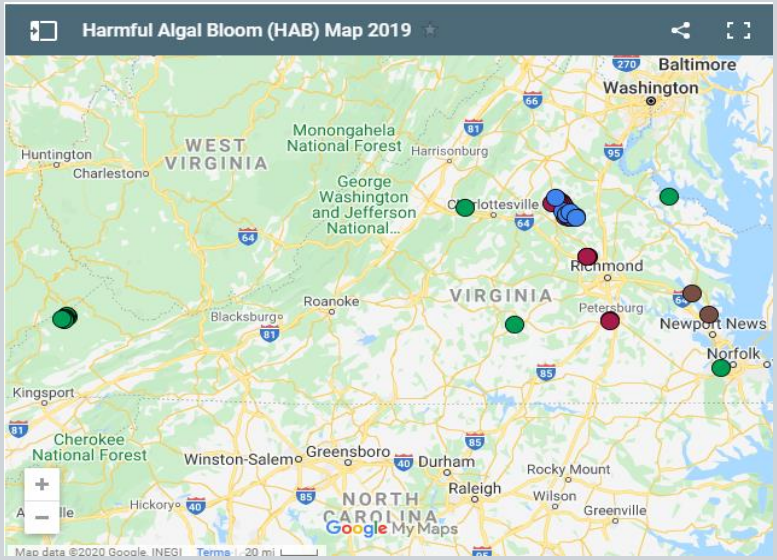
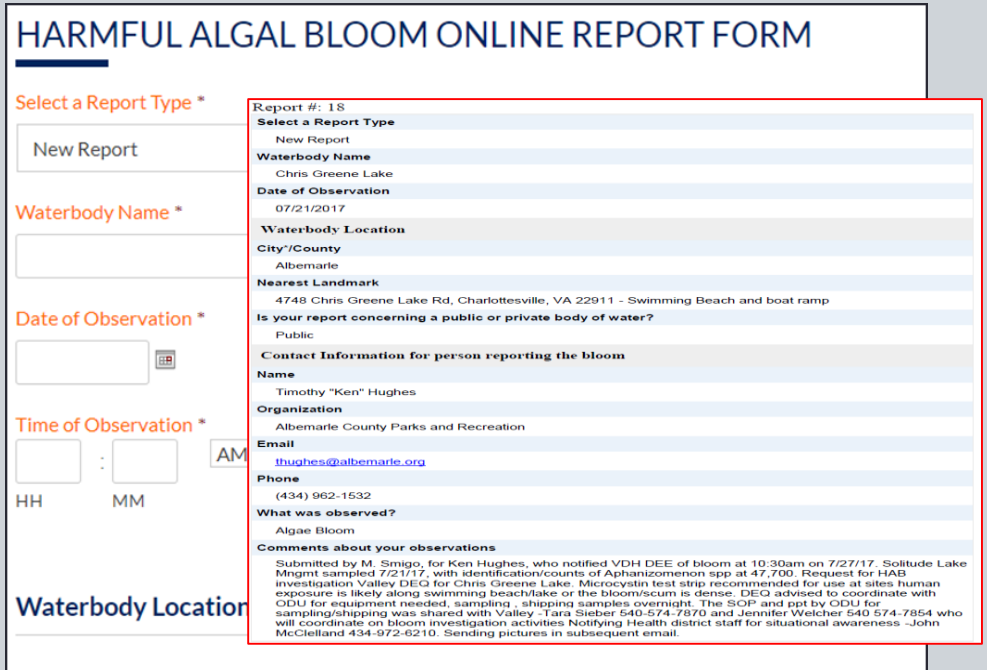
HAB Task Force Efforts to Prevent Human & Animal HAB Exposure

Waterborne website: swimhealthyva.com supports HAB Surveillance MAP – update weekly and as needed – we use HAB Crowd Sourcing – only for Lake Anna

- HAB Online Submittal Form
- Talking points
- Map for State Poison Control Centers
- Shared CDC sites for useful materials and resources

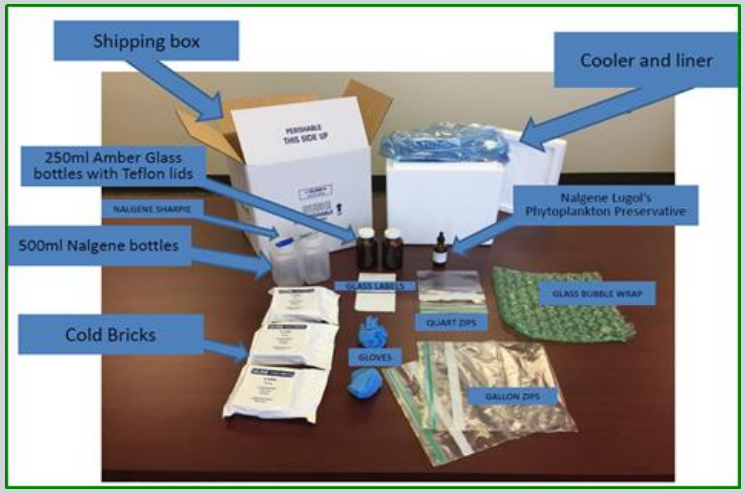






Outreach and Education

- Educational signage
- Brochures
- Warning signage
- HAB sampling Kits with supplies and instruction to help partners for HAB sampling



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HAB Virtual Toolkit - Resources

Harmful Algal Bloom Guidance & Resources

HAB Webpage, Surveillance Map & General Information	
Harmful Algal Bloom - Main Page It is the official VDH-DEE-HAB website. It contains information and resources related to the Harmful Algal Bloom Program.	www.HarmfulAlgaeVA.com
Harmful Algal Bloom Surveillance-Map It reflects the status of algae blooms during HAB season (March-November), as well as the results of algae bloom samples. The map is updated weekly or as needed year around.	http://www.vdh.virginia.gov/environmental-epidemiology/harmful-algal-blooms-habs/algal-bloom-surveillance-map/
HAB Online Report Form The form provides an option for online HAB report submittal. It can be utilized by the publics and environmental health professionals. It provides an easy way for the primary task force members to communicate HAB reports received by them with one another and to request assistance.	http://www.vdh.virginia.gov/environmental-epidemiology/harmful-algal-bloom-online-report-form/
Temporary Feature Page – *A.monilatum* Example of a bloom webpage for featuring a bloom of significance and a link to the FAQs. These pages facilitate public outreach during bloom events.	*http://www.vdh.virginia.gov/environmental-epidemiology/alexandrium-monilatum-hab-in-lower-york-lower-james-rivers-and-chesapeake-bay/* *http://www.vdh.virginia.gov/environmental-epidemiology/frequently-asked-questions-faqs-alexandrium-monilatum/*
HAB Taskforce Response Plan (2017) The response plan is intended as a brief, public-facing document which articulates the function, roles, and responsibilities of the primary taskforce agencies and expectations on services provided by each during HAB events.	http://www.vdh.virginia.gov/content/uploads/sites/12/2017/07/Virginia_HAB_ResponsePlan_Final_2017.pdf
HAB Universal Talking Points	http://www.vdh.virginia.gov/content/uploads/sites/12/2017/07/Talking-points-for-discussing-harmful-algal-blooms.pdf
VDH Brochures: ***Harmful Algal Blooms and other Organisms of Concern in Coastal Waters*** ***Cyanobacteria (Blue-Green Algae)***	http://www.vdh.virginia.gov/content/uploads/sites/12/2016/04/HABsBrochure.pdf http://www.vdh.virginia.gov/content/uploads/sites/12/2016/02/CyanobacteriaBro.pdf
Poison Hotline & Map of Centers Poison Control Centers may be engauged to utilize HAB talking points and specific waterbody-bloom information to the public during bloom events.	http://www.vdh.virginia.gov/content/uploads/sites/12/2017/07/Virginia-Poison-Control-Centers.pdf
Epidemiology Resources & Information	
HAB Process Flow The flow chart is intended to serve as a job aide for VDH staff for the coordinating, reporting, and investigating of HAB events.	http://www.vdh.virginia.gov/content/uploads/sites/12/2017/07/HABCommunicationProcessFlow_FINAL.pdf

***VDH HAB Human Screening Form** Is intended to facilitate the investigation of a reported waterborne exposure, such that the local health district can more easily determine whether or not the more comprehensive OHHABS human report form is necessary.	http://www.vdh.virginia.gov/content/uploads/sites/12/2017/07/Harmful-Algal-Bloom-Health-Survey_Final.pdf
CDC-One Health Harmful Algal Bloom System (OHHABS) Online Guidance and Training Resources The newly launched OHHABS system provides a database for collecting and storing environmental, animal, and human HAB exposure information. *OHHABS- Human Form and Guidance May be utilized by Epi Staff when one or more exposures are reported Event and Case Definitions Tables offer definition of HAB event and human HAB associated case.	http://www.cdc.gov/habs/ohhabs.html http://www.cdc.gov/habs/pdf/ohhabs-human-form.pdf and https://www.cdc.gov/habs/pdf/ohhabs-human-form-guidance.pdf https://www.cdc.gov/habs/pdf/ohhabs-case-and-event-definitions-table-3-14-17.pdf
CDC – HAB Associated Illness and Syndromes	http://www.cdc.gov/habs/illness.html
VDH – Marine Toxins and Associated Syndromes	http://www.vdh.virginia.gov/content/uploads/sites/12/2017/07/Marine-Toxins-and-Associated-Syndromes.pdf
VDH – Cyanobacteria Toxins and Health Effects	http://www.vdh.virginia.gov/content/uploads/sites/12/2017/07/Cyanobacteria-Genera_Toxins-Health-Effect.pdf.pdf
**Fax completed forms to DEE (804-864-8131)*	
Resources for Environmental Health Specialists	
VDH – Provisional Recreational Water Guidance for Microcystin and Microsystis Blooms This document supports decision-making by public health & environmental officials in response to the occurrence of a Microcystis algal bloom in Virginia's waters.	http://www.vdh.virginia.gov/content/uploads/sites/12/2016/02/VDHMicrocystisGuidance.pdf
HAB Public Notification *Press Releases* Template press releases for issuing or lifting recreational advisories. *HAB Signs* Signs for raising HAB-awareness and posting HAB-affected waterways. *EPA – Template Social Media Posts* Issuing an advisory Lifting an advisory	http://www.vdh.virginia.gov/environmental-epidemiology/public-notification-templates/ http://www.vdh.virginia.gov/environmental-epidemiology/hab-recreational-awareness-advisory-signs/. https://www.epa.gov/sites/production/files/2017-07/social-media-issue-advisory.docx https://www.epa.gov/sites/production/files/2017-07/social-media-lift-advisory.docx
Standard Operating Procedure For Sample	http://www.vdh.virginia.gov/content/uploads/sites/12/2017/07/Harm

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Thank You!

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